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Comments on 2013 IEP Draft MAST report  
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Below please find my comments

Overall I found the report to be a valuable summary of information and the conceptual models a good step towards formulating testable hypotheses.

However, as a general comment I don't think the conceptual models were taken far enough to reach the testable stage. The basic processes are growth, maturity, mortality and reproduction. The factors that impact each of these are almost certainly several, thus it is not possible to evaluate any single environmental driver at a time, but such analysis must be integrated in a life history model that looks at multiple factors. Further such analysis needs to account for the reliability of the observations, and cannot treat observations as known without error.

### **Lines 550-600 Transitional conceptual models**

I look at these conceptual models as a step towards defining a dynamic life history model that could be used to evaluate the impact of changes in anthropogenic and natural factors on abundance of smelt.

In such a model the key is functional relationships – specifically the relationship between factors and survival, growth, maturation etc.

In this context the conceptual models in the MAST Report are poorly defined, they are not explicit about which of these processes are affected by which driving factors.

For instance, in Figure 9 we have an adult population producing larvae (identified by number and size distribution). No problem. The three key processes are maturation, fecundity growth and survival. A range of factors are identified but the diagram doesn't say which of the processes are affected by which factors.

Figures 9-12: Need to explicitly look at growth, maturation and survival as separate processes. As it is they are all lumped together. These diagrams are not sufficient hypotheses for a life history model, rather seem only suitable for correlative or other statistical analysis.

Line 625: the idea of focusing all the analysis on these four study years seems a bit misguided – they may be highly informative years, but if we are to understand the way the environment affects smelt survival, the data from other years should be (a) informative and (b) consistent with the hypotheses..

Line 627: considering a range of alternative hypotheses instead of a null hypothesis is good.

Line 629: the text here makes it sound as if the authors don't want to move beyond conceptual models to quantitative models ... this is a worry because quantitative models will be required to test hypotheses.

Line 632 "Individual hypotheses are indicated in the transition CM diagrams (figs. 9-12) next to the arrows depicting each hypothesized linkage or outcome" Here I have to disagree because these "hypotheses" are not specific about which process (survival, mortality, growth etc) is impacted.

Lines 640-643: this really sounds like the authors are simply going to look for correlations rather than explore the actual key processes – goes back to their poor definition of "hypotheses."

#### **Chapter 4: Environmental Drivers and Habitat Attributes**

Lines 800-850 discussion of temperature effects. I don't see any recognition that there is habitat heterogeneity in temperature, and presumably smelt seek out the best temperature habitats.

Line 865: presumably the exact location of X2 depends on the tidal cycle – I am not sure I have ever seen this discussed – perhaps tides don't have much effect. A general issue in discussion of salinity is that a measure of the total area of habitat within the desired salinity levels might be very different from X2 and a better measure.

Line 1026: seems like a direct functional relationship between turbidity and feeding success would be appropriate – yet earlier text seem to suggest the authors didn't want to treat turbidity as an environmental factor and figure 10 doesn't show turbidity affecting feeding success, only predation risk.

Line 1035 "turbidity may decrease feeding" this seems the opposite of text above

Line 1154 "Transport mechanisms are most relevant to larval fishes, which have little ability to swim or otherwise affect their location". Generally larval fish have a lot of control through vertical migration.

Line 1168-1169 -- if larval smelt remain upstream then clearly they do have the ability to regulate movement and are not passive particles.

Line 1194 “Since predation is a natural part of functional aquatic ecosystems, predators are likely not responsible for long-term declines in populations of prey fishes, such as delta smelt, without some additional sources of stress that disrupts the predator-prey relationship. “ I don’t believe this for a second. In the Sacramento things are so altered it would seem highly likely that predators could easily be the cause of long term declines! To argue that the Sacramento is a “functional aquatic system” that has not been altered is a real stretch.

General comments on food section: it seems pretty clear that the food situation for delta smelt has gotten worse and this might explain the overall decline in delta smelt (at least partially). Thus any statistical analysis that uses changes in flow pattern or exports to explain the general decline may be misguided, and all we could look for is to explain the year to year variability caused by factors other than food around an overall trend dominated by food.

## **Chapter 5 Delta Smelt Response**

Line 1700 and around there: these survival rates are problematic because of observation error in the indices. You really need a state-space-model to do the analysis properly and it seems like much of this text might be overinterpretation, especially if flow affects the efficiency of different sampling methods.

Lines 1715 and 1716: **amen** – you need a life history model!

1754 Allee effects: there is little evidence for Allee effects in fish – Myers et al 1995, Liermann and Hilborn 1997

Line 2079: “ This suggests that within the range of adult abundance variability observed in SKT (fig. 3), adult stock size has not been a limiting factor in subsequent adult recruitment. Even a severely depleted adult stock can still produce a substantial number of larvae and a rebound in the delta smelt population, albeit with lower genetic variability than before (Fisch et al. 2011)”

This is really unclear, are the authors suggesting that recruitment is independent of the abundance of adult spawners?

This section is plagued by the use of 4 reference years and ignoring other years.

## **Overall delta smelt response section comments**

While this section does move forward from the general concepts of the conceptual model to more specific hypotheses, these hypotheses need to be tested in the context of a full life history model, that looks at the interaction of a range of factor simultaneously.